Testimony for the Record

David J. Modeen
Vice President and Chief Nuclear Officer
Electric Power Research Institute
Energy Subcommittee of the Science Committee
U.S. House of Representatives
April 6, 2006

On behalf of EPRI and its nuclear utility membership, I'd like to express our appreciation for this opportunity to address your committee. Most of my remarks today are based on a document prepared jointly by EPRI and the Idaho National Laboratory (INL), entitled, "Nuclear Energy Development Agenda: A Consensus Strategy for U.S. Government and Industry."

I will focus initially on the rationale and desired outcome of this strategy paper, as it relates to achieving closer alignment between industry and government on research & development (R&D) priorities, and its value. Second, I will review key content and recommendations from our paper. Finally, I will offer a few observations relative to the Global Nuclear Energy Partnership.

To a large degree, the paradigm for nuclear R&D has become, "Government only works on long term research, and industry only works on short term research." The EPRI-INL paper attempts to address this situation, which has become an obstacle to alignment on goals and priorities.

Steve Specker, our EPRI CEO, and John Grossenbacher, the Director of INL, met in May 2005 and committed to a joint effort to articulate a vision for nuclear energy and a supporting R&D agenda that could form the basis for a consensus between industry and government. The framework they agreed to pursue was based on an *80-20 paradigm*, to mend the long-term – short-term chasm: government should dedicate about 20% of its efforts to short-to-medium-term R&D, and industry should dedicate about 20% of its efforts to medium-to-longer term R&D.

EPRI and INL were well positioned to undertake this effort. EPRI is a nonprofit organization that manages a broad collaborative energy R&D program for the nation's electric utility industry, with significant international utility participation. Its R&D programs cover all technologies for electricity generation, transmission, distribution, and end-use. Specifically with respect to generation, EPRI advocates a diverse portfolio where nuclear plays a key role, along with clean coal, natural gas and renewables, wind, biomass and solar. My remarks today will only focus on the nuclear portfolio. All U.S. nuclear utilities are members of EPRI's nuclear power sector, along with many international utilities representing about 50% of the world's nuclear electric generation capacity. Together, they sponsor about $100M/year in R&D.

INL was identified by DOE in 2004 as its lead laboratory for nuclear energy research, development, demonstration, and education, with the goal of becoming the premier laboratory for nuclear energy within a decade. INL has extensive experience and supporting research facilities in all facets of nuclear energy research, including advanced reactor design, advanced fuel cycle design, nuclear materials and fuel design and testing, and advanced digital controls.

The renaissance in nuclear energy in the U.S. that is beginning to take shape poses challenges for both industry and government. Expectations will be high for safe, high quality, high performance technologies, delivered on aggressive schedules. The technology thrusts are highly interdependent. There will be significant resource limitations to goal achievement, requiring careful planning and prioritization. Planning must be realistic and address the commercial deployment in a competitive marketplace, not just the cost of completing the R&D. In short, we support industry and government working synergistically in pursuit of the technologies that will enable a major expansion of nuclear energy to improve energy security and environmental quality. For industry and government to achieve common objectives, we need alignment around a consensus strategy, as well as collaboration in both planning and execution.

EPRI and INL sought to align the technology portfolio with evolving nuclear energy policies and priorities. We reviewed five key government and independent studies on the future of nuclear energy, and found among them a consensus on the basic priorities for technology development:

1. “National Energy Policy: Report of the National Energy Policy Development Group,” May 2001. Augmented by Presidential Initiatives supporting the National Energy Policy.
2. “The Future of Nuclear Power,” Massachusetts Institute of Technology (MIT), July 2003.
3. “U.S. Department of Energy/Nuclear Power Industry Strategic Plan for Light Water Reactor Research and Development,” February 2004.
4. “Ending the Energy Stalemate: A Bipartisan Strategy to Meet America’s Energy Challenges,” The National Commission on Energy Policy (NCEP), December 2004.
5. “Moving Forward with Nuclear Power: Issues and Key Factors: Final Report of the Secretary of Energy Advisory Board Nuclear Energy Task Force,” January 2005.

Starting with consensus goals that were based on these well-recognized government and independent strategic plans, EPRI and INL assessed the nuclear energy R&D needed in the U.S. over the next half century.

A team of EPRI and INL staff mapped out a common set of high-level goals and time-based planning assumptions for nuclear energy, and then identified the R&D needed to prepare for deployment. These assumptions were formulated to be aggressive yet achievable, and were grounded upon open market principles. R&D challenges were identified, after which an assessment of current nuclear R&D programs was made to identify opportunities for action. The resulting strategy paper is currently undergoing industry review. We have shared the paper with DOE and are looking forward to discussing its merits and implications with DOE in detail.

These goals, paraphrased, are:

1. Ensure continued effectiveness of the operating fleet of nuclear power plants.
2. Establish an integrated spent fuel management system consisting of centralized interim storage, the Yucca Mountain repository, and, when necessary, a closed nuclear fuel cycle.
3. Build a new fleet of nuclear power plants for electricity generation.
4. Produce hydrogen for transportation and industry, and eventually for a hydrogen economy.
5. Apply nuclear systems to other process heat applications, including desalination.
6. Greatly expand nuclear fuel resources for long term sustainability, commercializing advanced fuel cycles when market conditions demand them in the long term.
7. Strengthen proliferation resistance and physical protection of nuclear fuel cycles.

The end result of the process that EPRI and INL followed was something we like to call "the R&D continuum." The fifty-plus year strategy for nuclear energy expansion and enhanced spent fuel management starts with a prioritized set of technology goals that flow logically and function in an integrated manner to achieve national objectives. This long time horizon is necessary to assess the R&D and demonstrations required to deploy nuclear fuel recycle systems, which will eventually be needed to assure sustainability as fuel resources are diminished through expanded use of the present once-through systems. With these "continuum" goals and supporting planning assumptions, a matrix of technology options was developed to address each goal, with an assessment of the technology capabilities and challenges of each option. From this matrix, a technology development agenda was derived, with timing and budgets aimed as much as practical to lead to private sector investment and deployment. The strategy paper assumed that each future Administration and Congress will expect Federal investments in nuclear R&D to be based on market demand as a key driver for long-term energy investments and deployment.

Planning Assumptions

The planning assumptions are <u>intentionally challenging</u> in order to help identify potential technology gaps, but also realistic and achievable. The predicted rapid growth is enabled by economic competitiveness and is also accelerated by the growing societal demand to increase non-emitting sources of generation. The planning assumptions are summarized below:

Currently Operating Nuclear Plants:

- All existing plants remain operational in 2015, and all have applied for and have been granted a 20-year life extension. Despite continued high safety performance and reliability, materials aging and equipment obsolescence demand rigorous monitoring, maintenance and modification with enhanced technology. Continued high performance is maintained in part by strategic, safety-focused plant management, and in part by new technology solutions, e.g., advanced monitoring and repair techniques, improved fuel performance, remedial coolant chemistry, greater reliance on advanced materials and digital controls.

- In the 2020-2030 timeframe, some plants are granted an <u>additional</u> 20 year license renewal (i.e., to 80 years). Advanced high performance fuel designs are introduced to enable longer fuel cycles, increase fuel economy, and significantly reduce the spent fuel generation rate.

New Plants for Electricity Generation:

- Many new nuclear plants are in commercial operation by 2015, with many more under construction. About 30 GWe of new nuclear electric generating capacity is on line or under construction by 2020. A cumulative total of about 100 GWe of new nuclear capacity has been added by 2030. By 2050, nuclear energy is providing roughly 35% of U.S. electricity generation, by reaching a cumulative total of about 400 GWe of new nuclear capacity. These numbers include electricity generation from all reactor types. They also include replacement power for a large segment of the current fleet of reactors, most of which have been retired or are close to retirement by 2050. This assumed build-rate severely challenges the existing U.S. industrial infrastructure.

New Plants for Process Heat:

- Based on a prototype Very High Temperature Reactor (VHTR) built and operating by 2020, a few VHTRs are in commercial operation by 2030, with more under construction. The VHTRs are initially dedicated to producing hydrogen for commercial and industrial use, focused primarily on rapidly expanding hydrogen demand by the oil, gas and chemical industries. They expand to a sizeable fleet by 2050, still focused primarily on industrial applications, but also serving a growing market for hydrogen to power fuel cells in hybrid and plug-in hybrid vehicles. U.S.-built commercial VHTRs are also serving hydrogen demand for U.S. companies at some petrochemical facilities operating overseas.

- Commercial versions of the VHTR, without hydrogen production equipment, also begin to serve process heat needs in the petrochemical and other industries. High value-added applications above 800°C are found in recovery of petroleum from oil shale and tar sands, coal gasification, and various petrochemical processes (e.g., ethylene and styrene).

Spent Fuel Management and Expanding Nuclear Fuel Resources:

- Licensing of a spent fuel repository at Yucca Mountain Nevada is completed by 2015, with construction and waste acceptance into the repository and into a co-located used fuel aging facility by that date. Interim storage away from reactor sites is established at two locations in the U.S., one east and one west of the Mississippi River (per NCEP recommendation).

- With a rapidly expanding nuclear energy industry and a growing inventory of spent fuel, an integrated spent fuel management plan for the U.S. emerges by 2015 that obtains bipartisan support for implementation. Key elements of this plan include expansion of the capacity of the Yucca Mountain repository; engineered cooling of the repository well in excess of 50 years (e.g., up to 300 years) prior to closure, in combination with centralized interim storage of spent fuel. Reprocessing of spent fuel is expected to begin in a demonstration plant by about 2030. The integrated plan addresses reprocessing, reactor and repository strategies, and offers a least-cost path for safe, long-term management of spent nuclear fuel.
    - The reprocessing part of this integrated strategy is based on an aggressive R&D program aimed at identifying cost-effective and diversion-resistant means to recover usable reactor fuel. These technologies will also demonstrate the ability to separate isotopes that contribute the most to heat output from spent fuel, thereby increasing repository storage capacity.
    - The reactor technology part of this integrated strategy develops fast reactors to recycle light water reactor spent fuel in order to transmute minor actinides as well as produce electricity. Following a demonstration plant, built and operated with government funding by about 2035, new fast reactors are deployed commercially, with government subsidy as needed for the waste-consuming mission. In the long term, the price of uranium increases to a level that supports recycle and eventually breeding.

Timing and Costs of the Nuclear Energy Development Agenda

The length of time that each technology will need to become commercially competitive to support the planning assumptions was estimated; and the R&D timeline needed for each technology was set to assure in-time licensing, demonstration, and commercialization. It is important to be realistic and objective about the time and resources needed to commercialize new technologies, factoring in technological, licensing, and funding uncertainties. The time required to prepare for and successfully complete regulatory approval was included.

The near term deployment goals for Advanced Light Water Reactors (ALWRs) for electricity generation, and a renewed commitment to R&D applicable to all LWRs (including current plants), are the least expensive. The bulk of federal investments are envisioned to occur over the next ten years, with continued modest funding after that as necessary, particularly on strategic areas such as advanced LWR fuels and materials. Costs of federal spending on electricity generation are based on continued funding of the NP2010 program on a cost-shared basis, and projections that the private sector will deploy ALWRs for electricity generation by 2015, based on limited federal incentives. No federal funding is expected for NP2010 after initial deployment of the first six plants. Total federal costs are roughly $500M, with equal or greater cost share by industry. This does not include costs of completing Yucca Mountain, which are uncertain; nor does it include the costs of revitalizing the nuclear industrial infrastructure.

Federal spending for nuclear generated hydrogen and other process heat applications are based on projections that the commercial VHTR technology can be demonstrated and will become competitive in the 2020 timeframe for industrial applications. This timeline assumes that conservative technology choices are made to maximize near term licensing and commercial deployment potential. Total federal RD&D costs for the nuclear hydrogen mission are estimated at $2B through about 2020, after which VHTRs will go forward as commercial units.

The costs of establishing nuclear fuel recycle are considerably higher than reestablishing the ALWR option for electricity generation and creating a commercial VHTR option for hydrogen generation. There are a number of significant technical, cost, and institutional challenges facing reprocessing that likely will delay the start of prototype demonstration until about 2030, and large scale deployment until about mid century. Rough costs to the federal government may reach $35B by 2050 and $60B by 2070. These estimates include both the RD&D costs and government-funded subsidies for a portion of the construction and operation of fast reactors and nuclear fuel reprocessing plants. These costs assume significant reliance on the private sector to construct and operate fast reactors as commercial power plants (after the technology is demonstrated and licensed, and the learning curve is ascended). These costs are highly uncertain because of the speculative nature of estimating when nominal commercial viability can be achieved for these facilities.

Rough costs to the federal government through mid-century depend primarily on whether the reprocessing plan has been structured to be the least-cost path for safe, long-term management of spent nuclear fuel (per above planning assumptions), or whether an accelerated plan is chosen for deployment that does not wait for the market price for uranium to drive the shift from the once-through fuel cycle to a closed fuel cycle, and from LWRs to a mix of LWRs and fast reactors.

There are fundamental differences between the deployment of nuclear energy generation with ALWRs and commercial VHTRs, and technologies to close the nuclear fuel cycle. There are commercial markets for electricity and hydrogen that enable near term deployment of ALWRs and a transition of VHTRs to the private sector as soon as the technology is ready. There is no comparable existing commercial market for fuel recycle.

A market will evolve for the fast reactor component of closed fuel cycle systems because fast reactors can produce electricity. However, based on today's technology and uranium ore/enrichment costs, fast reactors are not expected to compete with ALWRs in power generation until about mid-century. Economic parity could be achieved when ALWR fuel based on enriched U-235 becomes sufficiently more expensive than fast reactor fuel using recycled components. In the long term, as uranium prices rise, the alternate fuel cycles will advance to breeding and the need for subsidy will end.

<u>Even with the extended timetable for introducing fuel recycle in the U.S., a single expanded-capacity spent fuel repository at Yucca Mountain is still adequate to meet U.S. needs. Construction of a second repository is not required under this timetable.</u> If, however, reprocessing is implemented on an accelerated schedule before it is economic to do so based on fuel costs, then the federal government will need to bear a much larger cost.

In the U.S. context, the optimum scenarios for transitioning to fuel recycling require an R&D focus on those technologies that enable "full actinide recycle," and fast reactors. This path is preferred over one that maintains a "thermal recycle" mode using MOX fuel in light water reactors, because the high costs and extra waste streams associated with this latter path do not provide the desired benefits in terms of either non-proliferation or spent fuel management costs.

<u>Priorities for R&D Programs</u>

Light Water Reactor R&D

Significant R&D needs exist for the current fleet and the new fleet, especially in areas of age-related materials degradation, fuel reliability, equipment reliability and obsolescence, plant security, cyber security, and low-level waste minimization. Also, developing a new generation of high reliability LWR fuel with much higher burnup will better utilize uranium resources, improve operating flexibility, and significantly reduce spent fuel volume and transportation needs, resulting in additional improvements in nuclear energy economics. These are mid-term R&D needs whose impact would be considerable if accelerated with government investment.

Process Heat R&D

An essential consideration in reducing dependence on foreign sources of oil and natural gas is that hydrogen is necessary today in upgrading heating oil and gasoline, and in making ammonia for fertilizers. Making hydrogen today consumes 5% of all natural gas in the U.S and demand for hydrogen is growing rapidly. This situation can be improved with a nuclear system having hydrogen production capability as soon as it can be developed. In the long-term, many believe that a hydrogen economy is essential for revolutionizing transportation, in which case the demand for competitive and environmentally responsible hydrogen production will greatly increase. A large-scale, economical nuclear source would hasten that future.

Fuel Recycle R&D

Establishing a fuel recycle with the demonstrated ability to improve the management of nuclear wastes will bring added confidence in greatly expanding the use of nuclear energy. More importantly, advanced fuel cycle technology options provide the ability to supply sufficient nuclear fuel in the future to ensure long term energy and environmental sustainability.

Necessary technologies include cost-effective and diversion-resistant reprocessing to extract fuel and separate and manage wastes, as well as alternate reactor concepts (e.g., fast reactors) to generate electricity as they generate additional fuel and consume the long-lived actinides and other constituents. These increase confidence in achieving a sustainable economic fuel supply, reducing the spent fuel backlog, and increasing the effective capacity of Yucca Mountain many-fold in the long term. While there are significant technology challenges and market uncertainties, large-scale deployment of fuel recycle by government and industry could begin by mid-century.

Conclusions

- The strategy for nuclear energy development and implementation in the United States requires a consensus of industry and government.

- The overall strategy should be determined by considering a combination of market needs and national goals for energy security, national security, and environmental quality.

- The strategy should integrate near-term, medium-term, and long term priorities. R&D needs to proceed now on all fronts, but priorities for deployment are as follows:

  - **Near term**: License renewal for the current fleet, and licensing and deployment of new, standardized ALWRs are high priorities within the next decade. Timely near-term deployment of ALWRs will require demonstration of a workable licensing process, and completion of first-of-a-kind engineering for at least two standardized designs. Industry and DOE should cost share these R&D programs at a level to achieve deployment by 2015. In addition, DOE and industry should cost share certain LWR technology thrusts with significant national benefits, e.g., a new generation of LWR fuel. The newly authorized Nuclear Energy Systems Support Program is key to this objective.

    To enable the resurgence of nuclear energy, the near term elements of an integrated spent fuel management plan must proceed. These near term elements include completion of the repository at Yucca Mountain, deployment of multi-purpose canisters approved by the NRC, implementation of an effective spent fuel transportation system, and provision for "aging pads" to allow cooling prior to placement in the repository.

  - **Medium-term**: Development of a high temperature commercial VHTR is needed, capable of generating hydrogen at competitive costs, for initial use by the petroleum and chemical industries. Deployment will require concept development, defining end-user requirements and interfaces, resolution of design and licensing issues and prototype demonstration. This effort should be funded primarily by government, but targeted for expanding industry cost-sharing as commercialization becomes more promising.

  - **Long-term**: Development of fuel recycling technologies will eventually be needed for a sustainable nuclear energy future. These technologies will also support an integrated and more cost-effective spent fuel management plan. Key elements of this integrated plan include expansion of the capacity of the Yucca Mountain repository; provisions for engineered cooling of the repository well in excess of 50 years prior to closure, in combination with co-located "aging pads" for spent fuel. Reprocessing of spent fuel is expected to begin in a demonstration plant by about 2030, based on an aggressive R&D program aimed at identifying cost-effective and diversion-resistant means to recover usable reactor fuel. Successful development of fast-spectrum reactors will be required for "recycling" the usable uranium and plutonium recovered from spent fuel, while consuming the long-lived actinides. These facilities should be funded by government.

- The strategy should address rebuilding the nuclear industry infrastructure in the U.S. Currently, major equipment for nuclear plants must be procured offshore. Long term energy security requires that the U.S. industry have the capability of supplying and supporting U.S. energy producers, and better integrating energy supplier and end-user needs. These infrastructure needs include large numbers of new skilled construction workers, engineers, nuclear plant operators and other key personnel needed for construction, operation and maintenance of new facilities.

<u>Initial Observations Relative to GNEP:</u>

The above Consensus Nuclear Energy R&D Strategy for U.S. Government and Industry was drafted prior to DOE announcing its Global Nuclear Energy Partnership. Nevertheless, there is significant agreement and alignment between these independent planning efforts.

EPRI supports the vision and goals of the GNEP. We look forward to the opportunity to work with DOE on this important initiative.

The consensus strategy paper was intended to address the continuum of nuclear energy R&D needs. In contrast, GNEP has a somewhat more focused scope, so there are understandable differences between the two approaches.

Important areas of substantial agreement include:

- <u>Near term deployment of ALWRs and the licensing of Yucca Mountain.</u> The NP2010 program is critical to the future expansion of nuclear power and ultimately to moving the nation to a more sustainable and secure energy future. Further, we agree with GNEP that under all strategies and scenarios for the future of nuclear power, the U.S. will need a permanent geologic repository.
- <u>Creating a nuclear fuel leasing and used fuel take-back regime for "user" nations in return for their commitment to refrain from developing and deploying enrichment and reprocessing technologies.</u> This central foundation for GNEP was supported by the EPRI-INL paper, based primarily on the recommendation in the Dec. 2004 report of the National Commission on Energy Policy, as a vital non-proliferation initiative.
- <u>Improving the cost and diversion resistance of reprocessing technologies before deployment.</u> Advanced separation technologies that are more proliferation resistant and more cost effective than currently available technologies are essential objectives. Today's recycling technology has significant limitations that effectively eliminate it as an option to accomplish the GNEP non proliferation and spent fuel management objectives.

- Developing advanced fast spectrum reactors for reducing the long-lived, heat producing isotopes present in spent fuel. This is an essential step for improving spent fuel management, since single-pass recycling in LWRs provides little or no reduction in long-lived waste volume and heat output. The alternative, "full actinide recycle" will reduce heat output, and may also contribute to diversion resistance by relying on processing schemes that keep minor actinides and plutonium together.
- Advanced reactors will need to be certified by the Nuclear Regulatory Commission.
- Perhaps most important to Congressional deliberations, our work and the GNEP agree that well-crafted, deliberate, and rigorous R&D is needed now to advance both reprocessing and fast reactor technologies.

As discussed above, our estimate is that reprocessing in a large scale demonstration plant would begin operation by about 2030, with fast reactor technology demonstration in the same timeframe. Smaller scale pilot demonstrations may be feasible earlier than 2030. Full scale commercial deployment would occur in the 2050 timeframe. These timelines are more conservative than corresponding deployment estimates provided in GNEP documents. We believe that the significant technical, resource, and licensing challenges facing these advanced technologies will drive deployment dates.

It is important to note the origin and implications of these timing projections. As previously stated, we believe that starting the R&D now is a high priority. In short, our longer timelines should not be interpreted as a recommendation to "go slow," but rather as a belief that the technical challenges to moving from laboratory to commercial scale are daunting, and that achieving end results that are cost effective is equally challenging. Hence we encourage adequate funding for GNEP, with a program timeline and challenging yet achievable milestones. We also encourage adequate funding for other priority nuclear energy programs such as NP2010, Nuclear Energy Systems Support Program, and the nuclear hydrogen mission. We believe that an aggressive nuclear fuel recycling technology development program, even if it takes longer than currently envisioned, will still be beneficial.

On the subject of repository deployment, we found that "a single expanded-capacity spent fuel repository at Yucca Mountain is adequate to meet U.S. needs, and that construction of a second repository is not required under this timetable." This is due to a number of factors, including:

- Modifying the legislative limit on the Yucca Mountain repository capacity to permit utilization of its full technical capacity
- Developing a new generation of high performance LWR fuel in the 2010-2020 timeframe, which will reduce the rate of spent fuel generation in the U.S. by up to a factor of two.
- Maintaining engineered cooling of the repository before final closure for periods of time in excess of 50 years to allow for decay of the shorter term fission products.
- Alternatively or in combination with in-repository cooling, temporary centralized storage or aging pad sites can be provided where spent fuel is cooled for an appropriate length of time before repository emplacement.
- Deployment of reprocessing and fast reactors can be initiated in time to adequately manage used fuel within a single expanded-capacity geological repository.

The EPRI-INL paper identifies energy and environmental sustainability as the primary justification for fuel recycling. Recycling nuclear fuel may also enable breeding of new fuel, which will extend nuclear power's contribution to future energy supplies for many centuries to come. We believe that improved spent fuel management is a potential inherent benefit of recycling, with the degree of improvement dependent upon technology advances. Based on its extensive work, EPRI believes that the current repository design poses a small and acceptable risk to society. This will remain so, whether or not the long lived actinides are reduced by recycling. So the advantages of recycling to the repository primarily relate to the efficient use of repository space, and having the flexibility to recover and recycle prior-emplaced used fuel, if and when technical and economic conditions so dictate.

We support the assured fuel supply and used fuel take-back regime proposed by the Administration. For this regime to gain acceptance among user nations, the U.S. and other fuel supplier nations must provide assurance of their ability to meet commitments for both fuel supply and take-back, in order to obtain early commitments from the user nations to forgo enrichment and reprocessing. This is an important reason why completion of centralized interim storage facilities and a permanent repository are urgent to success of the fuel supply and take-back regime, even before recycling is ready.

Finally, we support development of a comprehensive plan and joint efforts to rebuild our national nuclear infrastructure. Currently, major equipment must be procured offshore, and aging workforce issues point to the need for aggressive training and recruiting initiatives. Long term energy security requires that the U.S. industry have the capability of supplying and supporting U.S. energy system vendors, architect-engineers, and better integrating energy supplier and end-user needs. Workforce infrastructure needs include large numbers of new skilled construction workers, engineers, nuclear plant operators and other key personnel needed for construction, operation and maintenance of new facilities. I share with other industry spokesmen the current concern for lost funding to nuclear university education programs.

In summary, EPRI would like to work with DOE on creating a consensus nuclear R&D strategy for the future. U.S. utilities accept the DOE premise that GNEP is primarily a federal initiative for governmental purposes, and thus should be funded by federal appropriations. Our members are presently focused on maintaining excellent performance of current plants and preparing for near-term deployment of ALWRs. These are the areas that utilities believe justify cost-sharing with DOE at the present time. EPRI and its members are interested in helping inform the R&D agenda for long-term programs. If the R&D is successful, they will be ready to cost share advanced reactor deployment in a manner consistent with the EPRI-INL Nuclear Energy R&D Strategy paper and the "80-20 paradigm" discussed earlier.